

# DEPARTMENT OF TRANSPORTATION FEDERAL AVIATION ADMINISTRATION SPECIFICATION

## ANTENNA ARRAY, UHF TROPOSCATTER

### 1. SCOPE

1.1 Scope.- The equipment described herein is a multi-element, vertically-polarized directional antenna array, providing moderate gain in the air-ground communications coverage. The antenna array will be installed on Government-furnished towers established at remote air-ground facilities subject to severe weather conditions. Installation of the array by the contractor at the remote air-ground facility is not a part of these requirements.

### 2. APPLICABLE DOCUMENTS

2.1 FAA specifications and standards.- The following FAA specifications and standards of the issues specified in the invitation for bid or request for proposals form a part of this specification:

FAA-D-1272	Instruction Booklets, Electronic Equipment
FAA-G-2100/1	Electronic Equipment, General Requirements: Part I, General Requirements for all Equipment
FAA-R-1030	Packing of Electronic Equipment
FAA-STD-003	Paint Systems for Structure

(Copies of this specification and other applicable FAA specifications and standards may be obtained from the Federal Aviation Administration, Washington, D. C. 20590, ATTN: Contracting Officer. Requests should fully identify material desired, i.e., specification numbers, dates, amendment numbers, standard numbers; also, requests should state the contract involved or other use to be made of the requested material.)

### 3. REQUIREMENTS

3.1 Equipment to be furnished by the contractor.- Each antenna array furnished by the contractor shall meet all the requirements of this specification. Instruction books shall be in accordance with FAA-D-1272.

#### 3.2 Test conditions and power source

3.2.1 Service conditions.- The ambient conditions shall be those of Environment III (1-3.2.23, FAA-G-2100/1).

3.2.2 Power source.- The reference to AC line voltage, frequency, and DC power of Paragraphs 1-3.2.21, 1-3.2.22, and 1-3.2.23 of FAA-G-2100/1 are not applicable to this specification.

#### 3.3 Mechanical characteristics

3.3.1 Construction.- The antenna array shall be designed to mount on a 4-1/2 inch O.D. pipe (schedule 80, nominal size designation 4 inch) running vertically up the side of a guyed tower, with a minimum spacing between pipe and tower of 3 inches (tower-and-pipe structure Government-furnished). All mounting clamps and mounting hardware necessary to secure the array to the vertical pipe shall be a part of the array equipment furnished by the contractor. The array shall consist of a minimum of eight collinear dipoles, backed with metal reflectors. The array shall be sectional so that two men using hand tackle can readily assemble the array on the supporting pipe. The sections shall be coded so that the array can be readily assembled to its designed mechanical-electrical configuration.

3.3.2 Length.- The vertical length of the array shall be no more than 35 feet when installed on the tower and the elements properly spaced.

3.3.3 Weight.- The total weight of the array, including the RF cable matching section and other fittings, shall be no more than 525 pounds.

3.3.4 Torsional moment.- The maximum torsional moment of array at 100 mph wind (no ice) shall not exceed 800 foot pounds to the schedule 80 pipe.

3.3.5 Hardware.- All necessary hardware and the required RF cable matching sections shall be furnished as part of the antenna array. The mating plug for the RF input connector is not required to be furnished; this modifies 1-3.16.3.1 of FAA-G-2100/1 but the input female connector shall be furnished to accept standard 7/8 inch, 50 ohm foamex transmission line equipped with a type N male connector.

3.3.6 Finish.- All exposed surfaces shall be corrosion protected. Where a paint finish is required, it shall be in accordance with FAA-STD-003.

#### 3.4 Electrical characteristics

3.4.1 Frequency range.- The frequency range of the antenna array shall be 277 through 329 MHz, and it shall meet all the requirements of this specification without having to be adjusted or tuned for operation throughout the frequency range.

3.4.2 RF power rating.- The antenna shall be capable of continuous operation with a 6 kW PEP signal input (1.5 kW carrier modulated 100 percent with a 1000 Hz signal).

3.4.3 RF impedance.- The antenna array shall be designed for direct operation with a 50 ohm transmission line.

3.4.4 Standing wave ratio.- The standing wave ratio shall be not more than 2.0 through the frequency band (3.4.1) at the input to the antenna array connector.

3.4.5 Radiation characteristics.- When the antenna array is oriented in its normal operating position and operating at frequencies within the frequency band 3.4.1, the radiated signal shall be vertically polarized and conform to the following:

3.4.6 Gain.- The antenna gain shall be a minimum of 17 dB over a dipole in free space at 0 degrees elevation in the vertical pattern.

3.4.7 Beamwidth.- The horizontal beamwidth shall be not less than 35 degrees at the 3 dB points.

3.4.8 Undesired horizontal radiation.- With reference to the centerline of the main lobe (desired horizontal azimuth coverage 3.4.7) all other minor lobes (undesired) displaced +90 degrees or more from the main lobe horizontal centerline shall be limited to a level of not more than 3 dB above a dipole.

3.4.9 Antenna RF feed system.- The radiating elements of the antenna array shall be binary fed. The insertion loss of the feed system shall be not more than 1.5 dB. The amplitude and phase of the current at the input to the connectors of the radiators shall be within the following tolerances:

- (a) Amplitude, spread not to exceed 10 percent,
- (b) phase, spread not to exceed 20 degrees.

#### 4. QUALITY ASSURANCE PROVISIONS

4.1 Design qualification test.- The following design qualification tests may, at the option of the contractor, be made in accordance with Paragraph 1-4.3.2.1 and 1-4.10 of FAA-G-2100/1 or by testing under the service conditions.

## 3.4.2 RF power rating

## 3.2.1 Environment III requirements

4.1.1 Additional design qualification tests, normal test conditions.- As a minimum, check at 3 MHz steps throughout the frequency range 3.4.1:

3.4.4, 3.4.1 Standing wave ratio

3.4.6, 3.4.1 Gain

3.4.7, 3.4.1 Beamwidth

3.4.8, 3.4.1 Undesired horizontal radiation

To prove compliance with 3.4.6, 3.4.7, and 3.4.8, the contractor, at his option, may select either or both of the following. Antenna range measurements of the assembled array or by design calculations based on range measurements of at least one element section of the array.

4.2 Type tests.- None required.

4.3 Production tests.- The following production tests shall be made under normal test conditions.

3.4.4 Standing wave ratio, check at 277 and 329 MHz

3.4.9 Antenna RF feed system

5. PREPARATION FOR DELIVERY

5.1 General.- See FAA-R-1030.

6. NOTES

6.1 None.

\* \* \* \* \*